PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Engineered Anadromous Salmonid Habitat

BPA project number: 20075
Contract renewal date (mm/yyyy): ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
University of Idaho

Business acronym (if appropriate) U of I

Proposal contact person or principal investigator:

Name	Ernest L. Brannon
Mailing Address	Aquaculture Research Institute, U of I
City, ST Zip	Moscow, ID 83844-2260
Phone	(208) 885-5830
Fax	(208) 885-5968
Email address	aqua@uidaho.edu

NPPC Program Measure Number(s) which this project addresses
4.1, 7.2, 7.2C, 7.2D, and 7.4

FWS/NMFS Biological Opinion Number(s) which this project addresses
ESA, Section 7 NMFS Biological Opinion on 1995-1998 Hatchery Operations in the Columbia River Basin, Consultation

Other planning document references

Short description
Construct an engineered stream channel at the USFWS Winthrop NFH as a new concept in natural-type chinook salmon and steelhead production supplementation.

Target species
Chinook salmon and steelhead trout

Section 2. Sorting and evaluation

Subbasin
Upper mid-Columbia

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more	If your project fits either of these	Mark one or more categories

caucus	processes, mark one or both	
☒ Anadromous fish ☐ Resident fish ☐ Wildlife	☒ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☐ Watershed councils/model watersheds ☐ Information dissemination ☐ Operation & maintenance ☐ New construction ☒ Research & monitoring ☐ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
	Grand Coulee Fish Maintenance	Supplementation

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Engineered stream development	a	Survey site
		b	Develop model stream specifications
		c	Construct engineered stream
2	Monitor performance of stream	a	Assess survival and performrmance of incubation and rearing steelhead

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	10/1999	9/2000	Incubation readiness	Engineered stream complete	95.00%
2	1/2000	9/2000	Emergence and rearing	Smoltification	5.00%
				Total	100.00%

Schedule constraints
None anticipated

Completion date
9/2000

Section 5. Budget

FY99 project budget (BPA obligated): $60,502

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	Ph.D. Research Assist. 12 mo Sr. Research Tech. 1 mo		15,332
Fringe benefits	Research Tech @34.5%		900
Supplies, materials, non-expendable property	Channel inlet/outlet screens		3,000
Operations & maintenance			
Capital acquisitions or improvements (e.g. land, buildings, major equip.)			
NEPA costs			
Construction-related support	Gravel, woody debris, rock, riparian vegetation, concrete		16,000
PIT tags	# of tags:		
Travel			7,260
Indirect costs	Off campus rate 25.8%		12,408
Subcontractor	Kinsel, WSU - engineered habitat		5,602
Other			
TOTAL BPA FY2000 BUDGET REQUEST			$60,502

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
UI	E.L. Brannon		20,631
USFWS	G. Pratschner		10,000
USFWS	Technician		4,000
USFWS	Backhoe use		8,000

Total project cost (including BPA portion)	$103,133

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$ 0			

Section 6. References

Watershed?	Reference
☐	Brannon, E.L. 1995. Chinook salmon and steelhead smolt migraiton. SOAC report to Bureau of Reclamation, Yakima, WA. pp 23.
☐	Bjornn, T.C. and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138 in W.R. Meehan, editor. Influences of forest and rangeland mangement on salmonid fishes and their habitats. American Fisheries Society, Special Pub.
☐	Chapman, D. W. and T.C. Bjornn. 1969. Distribution of salmonids in streams, with special reference to food and feeding. Pages 153-176 in Symposium on salmon and trout streams, 1968. Institute of Fisheries, University of British Columbia, Vancouver.
☐	Dauble, D.D. 1998. Habitat requirements of Columbia River salmonids: what's missing? Pages 109-113 in E. Brannon and W. Kinsel editors. Proceedings of Columbia river Anadromous rehabilitation and Passage Symposium. Aquaculture Research Institute, UI.

PART II - NARRATIVE

Section 7. Abstract

Development of an engineered stream is proposed as a new concept in hatchery supplementation. In collaboration with the USFWS, research on engineered streams is proposed by UI/WSU as a long-range ecosystem alternative to hatcheries for supplemention of weak or failing salmonid populations. The objectives are to provide the viability of natural-type engineered streams for chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*) production that match wild smolt quality and to monitor performance as a demonstration project for the new hatchery concept. The project is relevant to concerns about mitigation, anadromous species supplementation, hatchery problems in domestication and diversity, and habitat improvement. The approach is to develop the stream channel with engineering specifications based on biological and ecosystem criteria, and develop rearing strategies to optimize production, while maintaining genetic specificity, diversity, and natural smolt quality. The demonstration site selected is the water supply diversion of the USFWS Winthrop NFH where a basic stream channel, flow control structures, dikes and monitoring capability are already in place. Expected results will be a supplementation tool that markedly improves survivability of enhanced chinook stocks. Post-study monitoring will be accomplished by USFWS assessment of smolt quality, emigration success, and marked adult return success compared to standard hatchery production.

Section 8. Project description

a. Technical and/or scientific background

Declines in abundance of anadromous fish runs in the Columbia River drainage are attributable to a number of factors, including loss of spawning and nursery areas due to dams, mortalities of both juvenile and adult fish at hydroelectric developments in the migratory corridor, and reduced habitat quality in areas still accessible to anadromous fish. Salmon hatcheries in the Columbia Basin, developed to mitigate for the loss of habitat and natural production, are also considered part of the problem associated with loss of natural production through decreased genetic diversity (Ryman and Ståhl, 1980; Allendorf and Utter, 1979; Allendorf and Phelps, 1980; Cross and King, 1983; and Ståhl, 1983), and poor conditioning (Swain and Riddell, 1990).

Early hatcheries were developed as production facilities to mitigate for over fishing, and thus were not intended to enhance natural production, for which supplementation attempts to address. However, even the supplementation hatcheries have not been producing adult returns comparable with naturally spawning populations (Lichatowich and Mobrand, 1995). The problem is believed related to smolt quality. Hatchery fish experience higher mortality because they are often from introduced stock out of synchrony with local environments, and rearing in hatcheries conditions them inappropriately for the natural environment.

It is argued that if a long-term plan based on ecosystem health is to be successful, a different approach to hatchery production must be developed. Three essential elements for successful supplementation must include, (1) the genetics of the stock, (2) the environmental requirements of the stock, and (3) incubation and rearing experiences that are consistent with the life history of the species. These three elements have to become central in the supplementation programming process. As an integral component in a complex environmental system, salmonid stocks evolved in synchrony with their environment. Spawning time, emergence timing, juvenile behavior and distribution are not random, but rather occur in specific patterns of time and space for each population (Brannon, 1984). The seed stock, habitat, and the appropriate technology are the keys to producing fish that will be functional when entering the natural stream system.

The project proposed here is to demonstrate a revised anadromous salmonid artificial production program that includes supplementation by the use of engineered rearing channels that represent natural habitat. As an alternative to traditional hatchery methodology, a new concept is the development of incubation and rearing environments in constructed streams, engineered to provide optimum habitat based on natural stream conditions experienced by anadromous salmonid alevins, fry, and fingerlings.

The design of the engineered production facilities will take the form of a simulated stream with pool and riffle environments that promote the production of natural feed, and stocked at lower rearing densities compared to standard hatcheries. The approach will be to develop the specifications of the engineered stream using an engineered model that integrates the dynamics of the site and chinook salmon habitat requirements, construct the engineered stream channel, and establish the optimum rearing strategy to produce high quality smolts based on smolt condition criteria. Biological and engineering expertise will be integrated to develop rearing strategies to improve the quality of fish that must compete in the natural environment.

The site selected for the demonstration project and in collaboration with USFWS is on the Methow River, specifically in a water supply by-pass stream on the grounds of the Winthrop NFH (Fig. 1). Headworks and tailworks that control flow and fish access through the by-pass stream are already present. Working head over the by-pass stream length is approximately an 8 ft drop to the by-pass and 6 feet drop in elevation from the upper end of the stream to the Methow River. The water quality is the same as the river, and the adjacent riparian areas to the stream have developed naturally and will be enhanced for cover and shade.

The ultimate goal of the project is to demonstrate a new hatchery concept in supplementation to provide natural quality in hatchery produced smolts. This will be accomplished by the development of optimum rearing strategy in an engineered stream channel to produce natural-type smolts. Engineered stream design will include habitat criteria (Bjornn and Reiser 1991, Chapman and Bjornn 1969, Dauble 1998), fish density, (Brannon 1991), predation experience, and supplemental feeding regimes (Branon 1991).

b. Rationale and significance to Regional Programs

This alternative production concept with the local stock in facilities that mimic the biological habitat of the fish sufficiently well to produce wild-type smolts, is anticipated to become a major part of chinook, coho, and steelhead production in ecosystem management associated with supplementation. The engineered channel research project the Methow River represents a potential major change in supplementation strategy. A strategy providing natural-type quality fish will have substantial long-range implications on the use of artificial production that differs from the standard hatchery contribution. This project will provide the necessary background information on engineered streams to assist in up-grading or replacing traditional hatchery practices in supplementation. This project will also be a model for rearing channel systems that can be used to supplement degraded streams or to replace habitat lost from hydro development. Costs associated with such alternatives to standard hatchery construction and production would be substantially reduced, but more importantly, engineered channels would provide enhancement of local stocks within the environments and critical temperature regimes peculiar to the local basin.

The concept is an alteration of the approach used for chinook salmon spawning channels at McNary and Priest Rapids dams on the Columbia River. Unfortunately, these facilities intercepted chinook destined for upstream areas and they were held in undesirable environmental conditions to ripen. High mortalities resulted and the channels were unsuccessful for that reason. The facility proposed here is associated with terminal spawning conditions, and in environmental conditions that will be conducive to adult residence before spawning.

The project will have critical linkages to the Winthrop NFH program and hatchery assessment. Evaluation and control comparisons will be made with the tagging and smolt interception programs of the Winthrop NFH steelhead emigrants at monitoring stations downstream in the Columbia, as well as comparative assessment with hatchery produced fish at the time of emigration.

c. Relationships to other projects

This is a new project closely related to the Bureau of Reclamation hatchery production for the Grand Coulee Fish Maintenance Program to mitigate for habitat loss resulting from the construction of Grand Coulee Dam. The three hatcheries in the program all have potential applicaiton of the new hatchery concept using engineered channels for incubation and rearing of steelhead and chinook salmon.

d. Project history (for ongoing projects)

(Replace this text with your response in paragraph form)

e. Proposal objectives

Objective 1. -The first objective is to produce wild-quality fingerlings and smolts through the new hatchery concept, using engineered stream channels for supplementation of chinook salmon and steelhead runs. The channels will be engineered to mimic natural type stream habitat and stocked to provide supplementary fed, low fish densities to the smolt stage.

Objective 2 - The second objective is to provide rigorous monitoring of fry and fingerling behavior and condition in the engineered channel to assess performance in comparison with standard hatchery fish..

f. Methods

As listed above in the Section 4, four tasks are outlined to address the objectives associated with development and evaluation of the engineered stream channel. The four tasks are, (a) complete a site survey, (b) develop and complete specifications, (c) construction of the channel, and (d) monitor the success of incubation and rearing in the channel system compared to the adjacent hatchery. The conceptual plan for the stream channel will identify stable channel and habitat features. This will include assessment of channel alignment and structures within the project area, channel stability, habitat features, construction design, design life, and maintenance.

Hydrologic analysis will determine characteristic flows at the project site to identify the range of discharges appropriate for stream channel design and habitat features with species requirements. A minimum topographic survey will be completed to define the location and elevation of the physical features within the project area. Local hydrologic characteristics determining natural flow regimes create a wide variety of conditions that must be considered during the design of projects within any system. The stream channel will be designed to withstand flushing flows, maintain fish habitat features, and transport suspended sediment to silt deposit areas designed to trap silt for later removal. Average annual flow regimes in the Methow will be assessed for application in the channel regime., Average monthly flows to be estimated will include monthly minimum, mean monthly and monthly maximum.

a. Project area survey

Existing physical characteristics within the project area will be surveyed using project benchmark reference sites to established on or near a prominent physical feature within the project area. Cross reference will be made with a nearby USGS benchmark location. Additional temporary benchmarks will be established throughout the project area to provide vertical control during the design and construction phases as needed. All elevations determined within the project area will be relative to the project and temporary benchmarks. A Geodimeter System 400 electronic total station surveying instrument will be used to complete the site survey. Physical features such as edge of channel, existing topography, toe and top of road embankment, islands, edge of vegetation, secondary channels, and water surface elevations are located by determining the horizontal angle and distance to each feature from the instrument. Physical features will be determined with an accuracy of ± 0.5 feet horizontally and ± 0.1 feet vertically. All data collected by the total station will be stored in an electronic data recorder. Upon completion of the site survey, data stored in the electronic data recorder will be transferred into coordinate geometry software. In this program, the horizontal angle, vertical angle, and slope distance data recorded for each point is converted into northing, easting, and elevation coordinates. These coordinates along with point identification information are converted into a data exchange file (DXF) which is then input into AutoCAD™ to generate a site map of the project area. This map and the elevation data are then used in the design of the channel realignment and stabilization structures.

b. Design criteria

The biological and engineering design specifications for the engineered stream provide the base for the design drawings, and offer a detailed list of specific requirements or guidelines to maximize the engineering and biological benefits of the project. Under biological and habitat utilization criteria over the range of design flows occurring within the project area, hydraulic characteristics within the channel create the physical and biological conditions which produce the habitat features. Habitat utilization within the project area by the different age classes of the identified species is, therefore, a very important component in the design of rearing channel features. A habitat utilization table will be developed from biological experience and from the extensive literature. Design criteria will be based on criteria reviewed by Chapman and Bjornn (1969), Bjornn and Reiser (1991) and Dauble (1998). In this table, specific periods of the year will be identified for egg incubation, fry emergence, juvenile distribution, habitat features, downstream emigration. Information specific to the species in the Icicle River and Wenatchee River systems will be utilized as much as possible. Time periods in the habitat utilization table will be identified to the nearest week to coordinate the biological and hydraulic events of the project during the design of the rearing channel features. All in-channel structures and habitat features will be designed to ensure the greatest amount of habitat utilization within the rearing channels including preferred water depths and velocities, cover preferences, and substrate use and other hydraulic preferences. Utilization of these design criteria while developing channel realignment and stabilization features will ensure the hydraulics and instream structures maintain suitable habitat conditions over the freshwater residence period of the fingerlings.

Engineering specification criteria include channel features and instream structures that are designed with consideration given to the relationship between hydraulic geometry, channel shape, and channel gradient to stabilize channel cross section, channel profile, and riparian areas. All structures in the engineered channel will be designed to create the necessary habitat features with minimum alteration of any physical attributes or channel conformation with the range of flows specified in the design. Design criteria will include maximum flows, minimum flows, migration period flows, channel dimensions, channel length, control structure spacing, local channel gradient, and habitat feature installation. These criteria integrated with the biological utilization will ensure the channel structures create planned habitat attributes within the stream.

c. Project construction

Project design drawings as the final element in the conceptual plan will utilize the information collected, analyzed, and tested during the engineering and biological evaluations, and hydraulic model tests in preparation for project implementation. The design drawings and construction specifications will include design preparation, construction specifications, and a cost estimate. Project design drawings for the channel will identify the location and types of features to be incorporated. Using the conceptual plan, project design drawings will be completed to identify the location, alignment, and elevation of the rearing channel features. These designs will define the channel alignment and habitat features required to create the desired fish habitat components and features while satisfying the biological and engineering criteria.

Construction specifications for the rearing channel installation will consist of four components. These will include material quantities, material specifications, equipment specifications, and installation time estimates. Material quantities will be estimated using the project layout and installation details on the project design drawings. Excavation volumes and instream structure quantities will be developed during this analysis. Material specifications will be developed simultaneously with the material quantity estimate. These specifications will identify the size, type, and/or grade of each material to be used. Equipment specifications will be developed once the material quantities and specifications are determined. Standard installation times will be used to estimate equipment requirements and project completion times. These times have been developed using equipment performance charts and construction supervision experience. All construction specifications will be prepared using CSI format and will be included with the project design drawings on 3.5 inch computer floppy disks.

Construction of the stream, based on the specifications, will take the form of a meandering channel with surface area and structures in the corridor in the shape of riffles, pools and glides. Pool and glides will be engineered to provide diversity of habitat, woody debris, cover, contoured walls and floors, and velocity retreats. Other habitat features such as cover, overhanging banks, and large (15 to 30 cm) rock will be represented in the corridors. Gravel will characterize the riffle areas. Channel length will be constructed in replicate, 100 m long sections with sills separating each section. Ten, 100 m, replicate units will be represented over the length of the channel. Flow will be maintained through gate regulation at the headworks, and a total flow settling pond will intercept water before entering the channel to reduce silt loads in the channel.

A feed distribution system will be installed below water surface at the head of each riffle area. Water will be used as the transport medium to distribute the feed from hoppers along the southwest bank of the channel.

Genetic diversity will be maximized by artificially spawning live fish and seeding the channel in special subsurface incubators to provide natural incubation and emergence behavior from substrate incubation sites in the riffle areas. Artificial spawning live fish (20% of egg mass) will allow the channel to be seeded with maximum diversity.

d. Monitoring of performance

Monitoring of fish condition, growth and survival performance will be undertaken by sampling protocol over the length of the stream at three month intervals. Fish will be removed by traps placed on the riffles and seined in the pools to assess growth and condition. Enumeration and survival estimates will be made at the time of emigration in smolt traps at the channel outlet. These data will be compared will hatchery fish data assessed on the same parameters.

Fish will be evaluated in the standard hatchery fish assessment program with Pit tags or otolith marking for assessment of migrating success and survival at evaluation points downstream on the Columbia River. Comparisons of survival and migrant timing will be made with the Winthrop hatchery fish.

g. Facilities and equipment

The channel will be constructed on USFWS land at the Winthrop NFH. Channel location and water supply are provided for the project in the hatchery by-pass strream, water supply system. USFWS will provide a backhoe and operator for project excavation.

The fish used in the study will be steelhead from the USFWS hatchery at Winthrop. Eggs will be spawned from returning adults at the hatchery, as subsamples of the female egg masses, and either placed directly in gravel incubation areas above the pool areas, or eyed in the hatchery and planted as eyed eggs to maximize suvival and control over incubation conditions.

h. Budget

The budget covers salaries for a Ph.D. graduate student and part-time senior research technician, and materials associated with the construction of the channel. USFWS personnel and E.Brannon are contributing their time on the project to cost-sharing. Travel costs are associated with travel and overnight lodging at the project site. No capital acquisitions are included in the budget, since the site and facilities associated with the project are USFWS property. Indirect costs are calculated on the reduced rate of 25.8% associated with field work away from the University campus.

Section 9. Key personnel

Key personnel will include:
Ernest L. Brannon, UI, in life history and genetics of salmonids.
Greg Pratschner, USFWS in hatchery production.
Bill Kinsel, WSU, in habitat engineering

ERNEST LEROY BRANNON
December 1998

EDUCATION:

B.S., Fisheries, University of Washington, 1959
Ph.D., Fisheries, University of Washington, 1973

EXPERIENCE:

1988-pres: Director of the Aquaculture Research Institute, Professor of Fisheries Resources and Animal Science, and State Aquaculture Extension Specialist, University of Idaho, Moscow
1973-1988: Assistant/Associate/Full Professor, School of Fisheries, College of Ocean and Fisheries Sciences, Univ. of Washington, Seattle
1981-1993: Chair, Western Regional Aquaculture Consortium (at the Univ. of Washington, Seattle)
1974-1983: Director, Finfish Aquaculture Prog., College of Fisheries, Univ. of Washington, Seattle
1971-1972: Chief Biologist, Int'l Pacific Salmon Fisheries Comm. (IPSFC), New Westminster, BC., Can.
1969-1971: Supervisor, Sockeye Management Research, IPSFC, New Westminster, B.C., Can.
1959-1969: Research Biologist, Fisheries Management, Artificial Propagation, Spawning Channel Development and Fish Culture, IPSFC, New Westminster, B.C., Can.
1953-1959: Field Management, IPSFC, New Westminster, B.C., Can.

CURRENT RESEARCH:

1999-2000 Columbia Basin White Sturgeon Genetic Variation. BPA.
1998-1999 Columbia River Chinook Salmon and Steelhead Population Structure. BPA.
1998-1999 New Methods of Wastewater Treatment for Idaho's Aquaculture and Confined Animal industries. EPA.
1996-1999 The Center for Salmonid and Aquatic Species at Risk. NSF-EPSCoR.
1990-on Genetic Analysis of _Oncorhynchus nerka_. BPA.

RECENT PUBLICATIONS:

Schelling, G.T., R.A. Roeder, E.L. Brannon, J.C. Byatt, and R.E. Rompala. 1998. Choline and betaine supplementation to rainbow trout administered bovine somatotropin. Proceedings of the Triennial Meeting of the World Aquaculture Society, February 15-19, 1998, Las Vegas.

Brannon, E.L. 1998. Columbia River downstream migrant passage and habitat recovery. *Pages 193 - 199 in* E.L. Brannon and W.C. Kinsel, editors. Proceedings of the Columbia River anadromous salmonid rehabilitation and passage symposium (June 5-7, 1995, Richland, WA). Sponsored by the University of Idaho and Washington State University. Aquaculture Research Institute, Moscow, Idaho.

Cummings, S. A., E. L. Brannon, K. Adams, and G. H. Thorgaard. 1997. Genetic analyses to establish captive breeding priorities for endangered Snake River sockeye salmon. *Conservation Biology* 11(3):662-669.

Brannon, E.L. and A.W. Maki. 1996. The *Exxon Valdez* oil spill: Analysis of impacts on the Prince William Sound pink salmon. *Reviews in Fisheries Science* 4(4):289-337.

Powell, M.S, G.A. Thorgaard, R.L. Williams, B.A. Robison, J.C. Faler, and E.L. Brannon. Genetic analysis of sockeye salmon (*Oncorhynchus nerka*) in Redfish Lake. Annual Completion Report, U.S. Dept. of Energy, Bonneville Power Administration, Portland. In preparation.

Powell, M.S., R.L. Williams, B.A. Robison, J.C. Faler, and E.L. Brannon. Spatial heterogeneity and phylogeography among sockeye salmon (*Oncorhynchus nerka*) in the Pacific Northwest. *Trans. Am. Fish Soc*. In preparation.

Powell, M.S., J.C. Faler, and E.L. Brannon. Potential for reestablishment of anadromy in populations of sockeye salmon (*Oncorhynchus nerka*). *Conservation Biology*. In preparation.

William C. Kinsel

100 Sprout Rd
Richland, WA 99352

Education

University of Nebraska	B.S. Civil Engineering	1958
University of Washington	M.S. Mechanical Engineering	1963
University of Nebraska	Ph.D. Engineering Mechanics	1966

Teaching Experience

1981 to Date	Associate Professor Civil and Mechanical Engineering Program Washington State University, Richland, WA
1967 to 1981	Adjunct Lecturer Mechanical Engineering Program Tri-Cites University Center (Now WSU Tri-Cities) Richland, WA

Professional Practice

1977 to 1981	Consultant Exxon Nuclear Company Richland, WA
1970 to 1977	Manager, Hydraulics and Mechanics Westinghouse Hanford Company Richland, WA

Professional Recognition

Invited Testimony to the US House Committee on Natural Resources, *A Yakima River Basin Enhancement Project*, HB1620, November 1994.

Invited Testimony to the Washington State Legislature, House Committee on Natural Resources, *Salmon Restoration Demonstration Projects*, HSB 4024, February 1995.

Invited Testimony to the Washington State Legislature, Joint Select Committee on Salmon Restoration

Publications in the Past Five Years

R.A. Polehn and W.C. Kinsel, Transient Temperature Solution for Stream Flow from a Controlled Temperature Source. Water Resources Research, Vol. 33, No. 1, p 261-265, January 1997.

Kinsel, W.C. and Mullen, O.D., 1994, Thermal Factors Study for Hanford Salmon Experiment Station, Poster Session at Salmon Conference, Moscow, DI.

Polehn, R.A., and Kinsel, W.C., Transient Temperature Solution for a River with Uniformly Distributed Inflows. Presented at American Water Research Association Conference, Long Beach, California. October 20, 1997.

Stehlow, J.P. and Kinsel, W.C., Time History Seismic Analysis Method for Submerged Structures in Tanks with a Free Surface. Accepted for Twelfth ASCS Engineering Mechanics Conference, LaJolla, California. May 1998.

Professional Affiliations

Member, American Society of Civil Engineers
Member, American Society of Mechanical Engineers
Member, American Water Resources Association

GREGORY A. PRATSCHNER
9585 East Leavenworth Road
Leavenworth, WA 98826

EDUCATION:

M.S., Fisheries, University of Washington. Thesis: The Relative Resistance of Six Phenotypes of Coho Salmon *(Oncorhynchus kisutch)* to Cytophagosis, Furunculosis, and Vibriosis, 1978
B.S., Fisheries, University of Washington, 1975
Associate of Art and Science, Bellevue Community College, 1973

EXPERIENCE:

1988 - present	U.S. Fish and Wildlife Service, Leavenworth National Fish Hatchery Complex. Washington. Project leader of this 3 Station Pacific salmon and steelhead hatchery complex.
1984 - 1998	U.S. Fish and Wildlife Service, Dworshak National Fish Hatchery Complex, Idaho. Assistant manager of this Pacific salmon and steelhead hatchery.
1982 - 1984	U.S. Fish and Wildlife Service, Orangeburg/Bears Bluff National Fish Hatchery Complex. Assistant manager of the Bears Bluff unit of this warmwater/anadromous *(i.e.* striped bass and sturgeon) hatchery.
1981 - 1982	U.S. Fish and Wildlife Service, Fisheries Academy, West Virginia. Attended a nine month intensive course in fish hatchery management.
1978 - 1981	U.S. Fish and Wildlife Service, Wolf Creek National Fish Hatchery, Kentucky. Assistant manager of this rainbow trout hatchery.
1975 - 1978	University of Washington, Seattle. Graduate student conducting research on Pacific salmon genetics and pathology. Worked part-time at State of Washington and State of Alaska salmon hatcheries.

EXPERTISE:

G.Pratschner is the USFWS Leavenworth complex manager and has extensive experience in hatchery management and production. He received his MS at University of Washington in genetics and has expertise in protein electrophoresis. Mr. Pratschner will have responsibility as project manager on the USFWS site at Icicle Creek and will develop any environmental assessment and handle all permit inquiries necessary for the project. His extensive knowledge of hatchery systems and chinook salmon will also provide assistance in assessment of the engineered stream channel system, and will follow-up with long-range monitoring and evaluation of project chinook salmon performance.

ADDITIONAL REFERENCES

Allendorf, F. W. and Utter, F. M. 1979. Population genetics. *In* D. J. Randall, J. S. Hoar, and R. Brett (eds). Fish Physiology, Vol. 8. Academic Press, New York.

Allendorf, F. W. and Phelps, S. R. 1980. Loss of genetic variation in a hatchery stock of cutthroat trout. Trans. Amer. Fish. Soc. 109:537-543.

Brannon, E. L. 1984. Influence of stock origin on salmon migratory behavior. Pages 103-112*in* J.D. McCleave, G.P. Arnold, J.J. Dodson, and W.H. Neill (eds). Mechanisms of Migration . Plenum Press.

Brannon. E.L., 1991. Rainbow trout culture. Pages 21-55 *in* R.R. Stickney, editor. Culture of Salmonid Fishes. CRC Press, Boston.

Cross, T. F. and King, J. 1983. Genetic effects of hatchery rearing in Atlantic salmon. Aquaculture. 33:33-40.

Lichatowich, J.A.and L. E. Mobrand. 1995. Analysis of chinook salmon in the Columbia River from an ecosystem perspective. Mobrand Biometrics, Inc. USDE, BPA, Division of Fish and Wildlife. Project Number 92-18. 102 pp.

Ryman, N. and Stahl, G. 1980. Genetic changes in hatchery stocks of brown trout (*Salmo trutta*). Can. J. Fish. Aquat. Sci. 37:82-87.

Stahl, G. 1983. Differences in the amount and distribution of genetic variation between natural populations and hatchery stocks of Atlantic salmon. Aquaculture 33:23-32.

Swain, D. P. and Riddell, B. E. 1990. Variation in agonistic behavior between newly emerged juveniles from hatchery and wild populations of coho salmon, *Oncorhynchus kisutch*. Can. J. Fish Aquat. Sci. 47:566-571

Section 10. Information/technology transfer

Research results and channel design will be published in the BPA report series, and in the refereed journals. Technology transfer will be accomplished through journal publications, the University of Idaho web-site database on fisheries and aquaculture, and concept and results will be presented at conferences on NATURES, hatchery workshops, and other fisheries associations. Interpretation signs will be assembled at the channel site to extend the concept and production results to the public.

Congratulations!